



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/567,760	02/10/2006	Hideki Suda	Q93197	5643
23373 7590 04/02/2009 SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037				
EXAMINER RUGGLES, JOHN S				
ART UNIT		PAPER NUMBER		
1795				
MAIL DATE		DELIVERY MODE		
04/02/2009		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/567,760

**Applicant(s)**

SUDA, HIDEKI

**Examiner**

John Ruggles

**Art Unit**

1795

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 February 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 2 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 2 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 February 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/5508)
- Paper No(s)/Mail Date 2/10/06
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Priority***

The instant application is a national stage (371) entry of PCT/JP04/11712 having an international filing date of 8/9/04, which further claims foreign priority to JP 2003-293835 filed 8/15/03.

However, Applicant cannot rely upon the foreign priority papers to overcome any rejection in this Office action, because a translation of said foreign priority papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

### ***Information Disclosure Statement***

The listing of references in the International Search Report (ISR) dated 11/16/04 is not considered to be an information disclosure statement (IDS) complying with 37 CFR 1.98. 37 CFR 1.98(a)(2) requires a legible copy of: (1) each foreign patent; (2) each publication or that portion which caused it to be listed; (3) for each cited pending U.S. application, the application specification including claims, and any drawing of the application, or that portion of the application which caused it to be listed including any claims directed to that portion, unless the cited pending U.S. application is stored in the Image File Wrapper (IFW) system; and (4) all other information, or that portion which caused it to be listed. In addition, each IDS must include a list of all patents, publications, applications, or other information submitted for consideration by the Office (see 37 CFR 1.98(a)(1) and (b)), and MPEP § 609.04(a), subsection I. states, "the list ... must be submitted on a separate paper." Therefore, the references cited in the Search Report have not been considered. Applicant is advised that the date of submission of any item of information or any missing element(s) will be the date of submission for purposes of

determining compliance with the requirements based on the time of filing the IDS, including all "statement" requirements of 37 CFR 1.97(c). See MPEP § 609.05(a). The JP foreign documents listed on the 2/10/06 IDS have **not** been received.

The information disclosure statement filed 2/10/06 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature (NPL) publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed.

### ***Drawings***

(i) Figures 3, 4, 5, and 6 must each be designated by a legend such as --Prior Art--, because only that which is old is illustrated in these drawings (each of these drawings is indicated as being "conventional" in the corresponding brief description(s) thereof found in the specification at page 6 line 22 to page 7 line 3, abbreviated as p6/L22 to p7/L3, and in further detail at p1/L11 to p4/L25). See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

The disclosure is objected to because of the following informalities: (1) at p9/L26-27, "AS a consequence" should be corrected to --[[AS]] As a consequence--; (2) at p10/L6, "cleaning was carried" must be corrected to --cleaning was carried out--; and (3) at p10/L13, "In

foregoing embodiment” should be changed to --In this foregoing embodiment--, to clarify that this passage refers to the same foregoing embodiment as that previously mentioned at p10/L12.

Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Yasuzato et al. (US 6,004,699) or Applicant's Admitted Prior Art (AAPA) and either Ito et al. (US 6,030,729) or Kim (US 6,576,374).**

*Yasuzato et al.* teach a phase shift mask (PSM) having auxiliary patterns surrounding an isolated main pattern (that differ in phase by a predetermined angle), each of these patterns are openings in a light intercepting film (light shielding film) on a selectively etched transparent substrate (with top surface recess aligned to light shielding film opening) and a method of manufacturing this PSM having auxiliary patterns (title, abstract). Figures 19A-19B illustrate such a PSM having auxiliary patterns 42a-42d surrounding a main pattern 41, each as openings in a light shielding film 142 on a transparent substrate 141 that is selectively etched at 43 to provide the desired difference in phase shift angle. This auxiliary pattern PSM is manufactured by preparing a photomask blank having a semi-transparent light shielding thin film 142 (of chromium oxynitride, CrON) on a transparent substrate 141 (of quartz), then patterning openings in the light shielding thin film 142 and etching top surface recess 43 to an appropriate depth in

the transparent substrate 141 such that the phases of light passing through the main opening 41 and the auxiliary opening 42 differ from each other by the predetermined angle (c17/L66 to c18/L61). Alternatively in the auxiliary pattern PSM shown by Figures 8A-8B, the light shielding thin film 102 can be any suitable material (e.g., having Cr as a main component, etc.) on transparent substrate 101 (of quartz) having a selectively etched PS region (c12/L27-67).

*AAPA* (in the instant specification at p1/L14 to p4/L25) describe known methods of manufacturing PSMs, each having auxiliary pattern openings 23 adjacent to an isolated main pattern opening 22 in a light shielding thin film 21 on a transparent substrate 20, where the main pattern opening 22 is aligned with a recess 24 etched into the top surface of the transparent substrate 20, such that phases of light passing through the main pattern opening 22 and light passing through the auxiliary pattern openings 23 differ from each other by a predetermined angle, as shown in prior art Figures 3-6. The **first prior art method** comprises: **(I)** as illustrated in Figure 4 - (a) *a first process* including (1) a step of preparing a photomask blank having a light shielding film 21 and a first resist film 25 formed in this order on a transparent substrate 20, (2) a step of exposing a pattern corresponding to a main pattern opening 22 and an auxiliary pattern opening 23 onto the first resist film 25 and then developing to form a first resist pattern 25a, a step of using the first resist pattern 25a as an etching mask for etching the light-shielding film 21 to form a light shielding pattern 21a, and (3) a step of stripping the remaining first resist pattern 25a; and (b) *a second process* including (4) a step of forming a second resist film 26 on the substrate obtained in the first process, (5) a step of exposing a pattern corresponding to the main pattern opening 22 and then developing to form a second resist pattern 26a, a step of using the second resist pattern 26a as an etching mask for etching part of the transparent substrate 20 to a

depth 24 such that phases of light passing through the main pattern opening 22 and light passing through the auxiliary pattern openings 23 differ from each other by a predetermined angle, and (6) a step of stripping the remaining second resist pattern 26a to complete the auxiliary pattern PSM. The **second prior art method** comprises: **(II)** as illustrated in Figure 5 - (a) *a first process* including (1) a step of preparing a photomask blank having a light shielding film 21 and a first resist film 27 formed in this order on a transparent substrate 20, (2) a step of exposing a pattern corresponding to a main pattern opening 22 onto the first resist film 27 and then developing to form a first resist pattern 27a, a step of using the first resist pattern 27a as an etching mask for etching the light-shielding film 21 to form a light shielding pattern 21b, then further etching part of the transparent substrate 20 to a depth 24 such that phases of light passing through the main pattern opening 22 and light passing through the auxiliary pattern openings 23 differ from each other by a predetermined angle, and (3) a step of stripping the remaining first resist pattern 27a; and (b) *a second process* including (4) a step of forming a second resist film 28 on the substrate obtained in the first process, (5) a step of exposing a pattern corresponding to the auxiliary pattern openings 23 and then developing to form a second resist pattern 28a, a step of using the second resist pattern 28a as an etching mask for etching the auxiliary pattern openings 23 in the remaining light shielding film, and (6) a step of stripping the remaining second resist pattern 28a to complete the auxiliary pattern PSM.

*Yasuzato et al.* or *AAPA* do not specifically teach: **III** the use of an additional etching mask (hard mask or etching stop) layer between the light shielding film and the overlying resist film during etching of the light shielding film pattern openings and further etching of the underlying transparent substrate in the prior art methods of manufacturing an auxiliary pattern

PSM (*instant claim 1*); or *[2]* that the light shielding film is etched by a fluorine based etching medium (etchant, *instant claim 2*).

However, the use of an additional etching mask (hard mask or etching stop) layer on a light shielding film during etching of openings in the light shielding film and further etching of an underlying transparent substrate is well known in prior art methods of manufacturing a PSM having such features, as exemplified by *Ito et al.* (where an etching stop layer protects an underlying light shielding film to prevent decrease in thickness during selective etching of a recess in an underlying transparent substrate, c11/L47-52) or *Kim* (where a protective etching stop layer protects an underlying light shielding film from the etchant used to selectively etch a recessed PS region in an underlying transparent substrate, c3/L17-27, and the protective etching stop layer further prevents undesirable deposition of residual (light shielding layer) material at the bottom of the recessed PS region in the transparent substrate to avoid lowering of transmittance and abnormally changing the resulting phase of light transmitted through the recess PS region, c8/L2-12).

*Ito et al.* teach a method of manufacturing a PSM having an etched PS recess by using an etching stop layer 703 on a light shielding film 702 during etching of openings in the light shielding film 702 and further etching of an underlying transparent substrate 701, as illustrated in Figures 8A-8E. These Figures 8A-8E show method steps of preparing a first resist 704 over an etching stop layer 703 (of e.g., carbon (C), etc.) on a light shielding film 702 (of e.g., MoSiO<sub>x</sub>, etc.) on a transparent substrate 701 (e.g., quartz, etc.) for resist patterning and separate anisotropic etching of the etching stop layer 703 (e.g., by oxygen (O<sub>2</sub>) gas, etc.) and the light shielding film 702 (by a CF<sub>4</sub> gas etchant, which is a fluorine based etchant, *[2]*), then etching the



transparent substrate 701 using a separate second resist layer 706 (by the same CF<sub>4</sub> gas etchant), and removing the second resist 706 and the etching stop layer 703 to form the PSM having etched PS recesses 707, 708 (at different depths). Addition of the etching stop layer 703 (as an etching mask or a hard mask) on the light shielding film 702 provides protection of the light shielding film 702 thickness (e.g., to ensure a uniform PS of 180°, etc.). This is followed by removal of the remaining etching stop layer 703 (by oxygen (O<sub>2</sub>) gas, c11/L5 to c12/L22). Besides MoSiO<sub>x</sub>, other light shielding film materials include: SiN<sub>x</sub>O<sub>y</sub> (c12/L27-33), Cr/CrO<sub>x</sub> (c13/L30-43), CrO<sub>x</sub>/Cr/CrO<sub>x</sub> (c14/L26-39), CrO, CrN, CrON, SiO, SiN, SiON, MoSiN, MoSiON, WSiO, WSiON, CrF, AlO, AlN, AlON, TiO, TiN, or TiON (c15/L41-45), or other material selected from a metal oxide, a metal nitride, a metal oxynitride, a metal fluoride, a semiconductor oxide, a semiconductor nitride, a semiconductor oxynitride, a metal semiconductor oxynitride (c15/L35-40), a metal semiconductor oxynitride, amorphous carbon, amorphous carbon hydride, or amorphous carbon fluoride (c8/L19-36).

*Kim* teaches a PSM blank having a protective layer (as an etching mask or etching stop layer) on a light shielding layer over the upper surface of a transparent substrate and a method of fabricating a PSM therefrom (title) by patterning a photosensitive (resist) layer thereon and patterning (selectively etching) the protective etching stop layer through the patterned resist layer, then selectively etching the light shielding layer through the overlying patterned resist layer and the protective etching stop layer, followed by etching a groove or recess in the underlying transparent substrate through the overlying light shielding layer and the overlying protective etching stop layer (that protects the light shield layer) to form a PS region in the transparent substrate (abstract). Figures 10-15 show the corresponding method steps of

manufacturing this PSM having an etched transparent substrate PS region 51 (according to front page Figure 15) by forming a light shielding film 42 (of e.g., opaque Cr, etc.) on the upper surface of a transparent substrate 40 (of e.g., quartz, etc.), forming a protective layer pattern 44a (etching stop layer pattern of e.g., MoSiON, etc.) thereon by etching through an overlying first resist pattern 46a to uncover portions of the underlying light shielding layer 42, then etching (by anisotropic dry etching in chlorine ( $\text{Cl}_2$ ) and  $\text{O}_2$  gas etchant) uncovered portions of the light shielding layer 42 while using the etching stop pattern 44a as an etching mask to uncover first and second regions (48 and 49) of the transparent substrate 40, followed by forming a second resist layer pattern 50 thereon and etching a groove or a recess 51 in the second region 49 of the transparent substrate 40 to form the PS region 51 while the etching stop layer pattern 44a protects the light shielding layer pattern 42a from the etchant (c3/L17-27) of fluoride gas (e.g.,  $\text{CF}_4$ ,  $\text{CHF}_3$ ,  $\text{SF}_6$ , etc., [2]), and removing at least a part of the etching stop layer pattern 44a (c5/L44 to c8/L11). The protective etching stop layer pattern 44a protects the underlying light shielding film 42 from the etchant used to selectively etch the recessed PS region 51 in the underlying transparent substrate 40 (c3/L17-27), and the protective etching stop layer pattern 44a further prevents undesirable deposition of residual (light shielding layer) material at the bottom of the recessed PS region 51 in the transparent substrate 40 to avoid lowering of transmittance and abnormal change of the resulting phase of light transmitted through the recess PS region 51 (c8/L2-12).

It would have been obvious to one of ordinary skill in the art at the time of the invention in any of the methods of manufacturing an auxiliary pattern PSM having a light shielding film with openings on a transparent substrate that is selectively etched to form a PS recess therein (as

taught by *Yasuzato et al.* or *AAPA*) to include the use of an additional etching mask (hard mask or etching stop) layer on the light shielding film during etching of the openings therein and further during etching of the underlying transparent substrate to form the PS recess therein; because the additional etching stop layer would have provided a reasonable expectation of success for protecting the underlying light shielding film to prevent decrease in thickness during selective etching (by a fluorine based etchant, *[2]*) of the recess in the underlying transparent substrate (as taught by *Ito et al.*, *[1]*); or because the additional etching stop layer would have provided a reasonable expectation of success for protecting the underlying light shielding film from the etchant (such as a fluorine based etchant, *[2]*) used to selectively etch a recessed PS region in the underlying transparent substrate, and for preventing undesirable deposition of residual material (from the light shielding layer) at the bottom of the recessed PS region in the transparent substrate to avoid lowering of transmittance and to avoid abnormal changes of the resulting phase of light transmitted through the recessed PS region (as taught by *Kim*, *[1]*).

**Claims 1-2 are rejected under 35 U.S.C. 103(a) as being obvious over Okubo et al. (US 7,314,690) in combination with either Yasuzato et al. (US 6,004,699) or Applicant's Admitted Prior Art (AAPA) and either Ito et al. (US 6,030,729) or Kim (US 6,576,374, each as discussed above).**

The applied *Okubo et al.* reference has a common assignee (Hoya Corporation) with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed

in the reference was derived from the inventor of this application and is thus not an invention “by another”; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

*Okubo et al.* teach and recite methods of producing photomasks (such as a halftone PSM) that include preparing a photomask blank by forming a resist film over an etching mask film on a light shielding film (such as a Cr film on a semi-transparent PS film) on a transparent substrate, exposing and developing the resist film to form a resist pattern, etching the etching mask film through the resist pattern to form an etching mask pattern, etching the light shielding film through the etching mask pattern and the remaining resist pattern or after removing the remaining resist pattern, optionally either etching a PS film pattern in between the transparent substrate and the light shielding film pattern or just further etching of the transparent substrate to form a PS recess therein, then either removing at least part of the etching mask pattern or leaving it on the completed photomask, but still removing the remaining resist pattern from the completed photomask, or optionally removing at least part of the light shielding film pattern (e.g., c21/L44 to c24/L41, etc.).

*Okubo et al.* do not specifically teach or recite: *[3]* that the etching mask (hard mask or etching stop) layer between the light shielding film and the overlying resist film during etching of the light shielding film pattern opening on the transparent substrate, and removing at least a part of the etching mask pattern or the etching stop layer pattern are for manufacturing an auxiliary pattern PSM (*instant claim 1*); or *[2]* that the light shielding film is etched by a fluorine based etching medium (etchant, *instant claim 2*).

The teachings of *Yasuzato et al.*, *AAPA*, *Ito et al.*, and *Kim* are each discussed above.

It would have been obvious to one of ordinary skill in the art at the time of the invention in the methods of manufacturing a mask (such as a PSM) having a patterned light shielding layer pattern or a PS pattern on a transparent substrate that is etched to form a recess therein (such as a PS recess) through an overlying etching mask pattern, previously etched by an overlying resist pattern (as taught or recited by *Okubo et al.*) to form an auxiliary pattern PSM (as taught by *Yasuzato et al.* or *AAPA*) that includes the use of an additional etching mask (hard mask or etching stop) layer on the light shielding layer pattern or the PS pattern on a transparent substrate during etching of an opening or a recess therein to form the desired photomask pattern, and removing at least a part of the etching mask pattern or the etching stop layer pattern to complete the PSM; because the etching stop layer would have been beneficial in forming the auxiliary pattern PSM by providing a reasonable expectation of success for protecting the underlying light shielding film or PS pattern to prevent decrease in thickness during selective etching (by a fluorine based etchant, *[2]*) on the transparent substrate (as taught by *Ito et al.*, *[3]*); or because the etching stop layer would have been beneficial in forming the auxiliary pattern PSM by providing a reasonable expectation of success for protecting the underlying light shielding film

from the etchant (such as a fluorine based etchant, *[2f]*) used to selectively etch a recessed PS region on the transparent substrate, and for preventing undesirable deposition of residual material (from the light shielding layer or the PS pattern) at the bottom of the recessed PS region on the transparent substrate to avoid lowering of transmittance and to avoid abnormal changes of the resulting phase of light transmitted through the formed PS region (as taught by *Kim*, *[3f]*).

### ***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

**Claims 1-2 are rejected on the ground of nonstatutory obviousness-type double patenting (ODP) as being unpatentable over claims 1-21 of U.S. Patent No. 7,314,690 [Okubo et al. of Hoya Corporation] in combination with either Yasuzato et al. (US 6,004,699) or Applicant’s Admitted Prior Art (AAPA) and either Ito et al. (US 6,030,729) or Kim (US 6,576,374, each as discussed above).**

Although the conflicting claims are not identical, they are not patentably distinct from each other; because the *Okubo et al.* patent claims recite methods of producing photomasks (such as a halftone PSM) that include preparing a photomask blank by forming a resist film over an etching mask film on a light shielding film (such as a Cr film on a semi-transparent PS film) on a transparent substrate, exposing and developing the resist film to form a resist pattern, etching the etching mask film through the resist pattern to form an etching mask pattern, etching the light shielding film through the etching mask pattern and the remaining resist pattern or after removing the remaining resist pattern, optionally either etching a PS film pattern in between the transparent substrate and the light shielding film pattern or just further etching of the transparent substrate to form a PS recess therein, then either removing at least part of the etching mask pattern or leaving it on the completed photomask, but still removing the remaining resist pattern from the completed photomask, or optionally removing at least part of the light shielding film pattern; whereas the instant claims recite a method of manufacturing an auxiliary pattern PSM by very similar steps of using an etching mask pattern or an etching stop layer pattern on top of the light shielding layer before etching to form openings in the light shielding layer and further etching to form a PS recess in the underlying transparent substrate, and removing at least a part of the etching mask pattern or the etching stop layer pattern to complete the PSM.

The *Okubo et al.* patent claims do not specifically recite: /3/ that the etching mask (hard mask or etching stop) layer between the light shielding film and the overlying resist film during etching of the light shielding film pattern opening on the transparent substrate, and removing at least a part of the etching mask pattern or the etching stop layer pattern are for manufacturing an

auxiliary pattern PSM (*instant claim 1*); or *[2]* that the light shielding film is etched by a fluorine based etching medium (etchant, *instant claim 2*).

The teachings of *Yasuzato et al.*, *AAPA*, *Ito et al.*, and *Kim* are each discussed above.

It would have been obvious to one of ordinary skill in the art at the time of the invention in the methods of manufacturing a mask (such as a PSM) having a patterned light shielding layer pattern or a PS pattern on a transparent substrate that is etched to form a recess therein (such as a PS recess) through an overlying etching mask pattern, previously etched by an overlying resist pattern (as recited by the *Okubo et al.* patent claims) to form an auxiliary pattern PSM (as taught by *Yasuzato et al.* or *AAPA*) that includes the use of an additional etching mask (hard mask or etching stop) layer on the light shielding layer pattern or the PS pattern on a transparent substrate during etching of an opening or a recess therein to form the desired photomask pattern, and removing at least a part of the etching mask pattern or the etching stop layer pattern to complete the PSM; because the etching stop layer would have been beneficial in forming the auxiliary pattern PSM by providing a reasonable expectation of success for protecting the underlying light shielding film or PS pattern to prevent decrease in thickness during selective etching (by a fluorine based etchant, *[2]*) on the transparent substrate (as taught by *Ito et al.*, *[3]*); or because the etching stop layer would have been beneficial in forming the auxiliary pattern PSM by providing a reasonable expectation of success for protecting the underlying light shielding film from the etchant (such as a fluorine based etchant, *[2]*) used to selectively etch a recessed PS region on the transparent substrate, and for preventing undesirable deposition of residual material (from the light shielding layer or the PS pattern) at the bottom of the recessed PS region on the



transparent substrate to avoid lowering of transmittance and to avoid abnormal changes of the resulting phase of light transmitted through the formed PS region (as taught by *Kim*, [3]).

**Claims 1-2 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting (ODP) as being unpatentable over claims 1-4 of copending Application No. 11/707,131 [Suda of Hoya Corporation, corresponding to US 2007/0190434] in combination with either Yasuzato et al. (US 6,004,699) or Applicant's Admitted Prior Art (AAPA) and either Ito et al. (US 6,030,729) or Kim (US 6,576,374, each as discussed above).**

Although the conflicting claims are not identical, they are not patentably distinct from each other; because the *Suda* application claims recite methods of manufacturing a mask (such as a PSM) that each include forming a resist film over a patterned coating layer (such as a light shielding layer pattern) having an opening therein, selectively writing to expose the resist film, developing the exposed resist film to form a resist pattern having an opening, then etching to form a recess in an underlying layer (such as a transparent substrate) through the opening in the overlying coating layer pattern (such as the light shielding layer pattern), as a hard mask pattern or an etching stop layer pattern, and through the opening in the resist pattern; whereas the instant claims recite a method of manufacturing an auxiliary pattern PSM that further includes the use of an additional etching mask pattern or an etching stop layer pattern on top of the light shielding layer before etching to form openings in the light shielding layer and further etching to form a PS recess in the underlying transparent substrate, and removing at least a part of the etching mask pattern or the etching stop layer pattern to complete the PSM.

The *Suda* application claims do not specifically recite: *[4]* the use of an additional etching mask (hard mask or etching stop) layer between the light shielding film and the overlying resist film during etching of the light shielding film pattern openings and further etching of the underlying transparent substrate, and removing at least a part of the etching mask pattern or the etching stop layer pattern for manufacturing an auxiliary pattern PSM (*instant claim 1*); or *[2]* that the light shielding film is etched by a fluorine based etching medium (etchant, *instant claim 2*).

The teachings of *Yasuzato et al.*, *AAPA*, *Ito et al.*, and *Kim* are each discussed above.

It would have been obvious to one of ordinary skill in the art at the time of the invention in the methods of manufacturing a mask (such as a PSM) having a patterned coating layer (such as a light shielding layer pattern) with an opening therein on an underlying layer (such as a transparent substrate) that is etched to form a recess therein (such as a PS recess, as recited by the *Suda* application claims) to form an auxiliary pattern PSM (as taught by *Yasuzato et al.* or *AAPA*) that includes the use of an additional etching mask (hard mask or etching stop) layer on the patterned coating layer (such as a light shielding layer pattern) during etching of the openings therein and further during etching of the underlying layer (such as a transparent substrate) to form the recess therein (such as a PS recess), and removing at least a part of the etching mask pattern or the etching stop layer pattern to complete the PSM; because the additional etching stop layer would have provided a reasonable expectation of success for protecting the underlying light shielding film to prevent decrease in thickness during selective etching (by a fluorine based etchant, *[2]*) of the recess in the underlying transparent substrate (as taught by *Ito et al.*, *[4]*); or because the additional etching stop layer would have provided a reasonable expectation of

success for protecting the underlying light shielding film from the etchant (such as a fluorine based etchant, [2]) used to selectively etch a recessed PS region in the underlying transparent substrate, and for preventing undesirable deposition of residual material (from the light shielding layer) at the bottom of the recessed PS region in the transparent substrate to avoid lowering of transmittance and to avoid abnormal changes of the resulting phase of light transmitted through the recessed PS region (as taught by Kim, [4]).

This is a provisional obviousness-type double patenting (ODP) rejection because the conflicting claims have not in fact been patented.

#### ***Conclusion and Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is (571)272-1390. The examiner can normally be reached on Monday-Wednesday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark F. Huff/  
Supervisory Patent Examiner, Art Unit 1795

/John Ruggles/  
Examiner, Art Unit 1795